

III B.Tech I Semester Regular Examinations, November 2008
LINEAR IC APPLICATIONS

(Electronics & Communication Engineering)

Time: 3 hours

Max Marks: 80

Answer any FIVE Questions
 All Questions carry equal marks

- Discuss about dc analysis of Dual input balanced output amplifier.
 - Why cascading is necessary for differential amplifier and explain its operation. [6+10]
- Broadly classify the integrated circuits for a wide range of applications.
 - Explain the operation of op - amp using block diagram.
 - What is a practical op - amp? Draw its equivalent circuit? [4+6+6]
- Find V_0 for the circuit shown in figure 3
 - Find R_1 and R_f in the practical integrator (lossy integrator), so that the peak gain is 20 dB and the gain is 3 dB down from its peak when $\omega = 10,000$ rad/sec. Use a capacitance of $0.01\mu\text{F}$. [8+8]

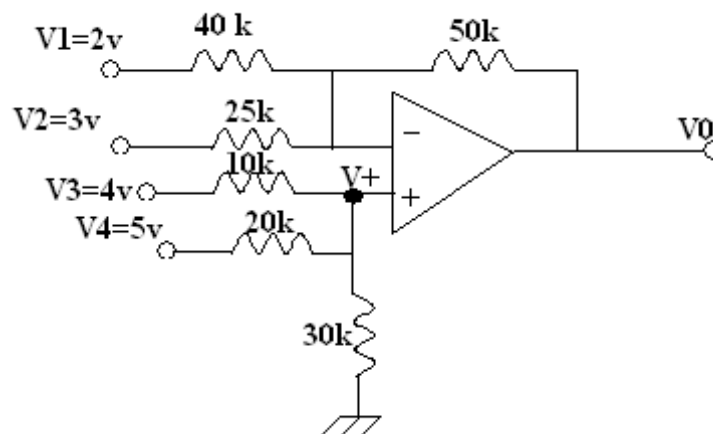


Figure 3

- Distinguish between astable, bistable and monostable multivibrators.
 - Determine V_{TH} and V_{TL} (TL: Lower threshold, TH: upper threshold) and hysteresis of the inverting comparator shown in figure4 [8+8]

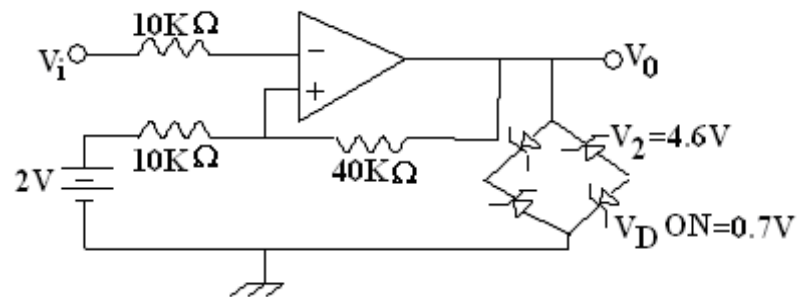


Figure 4

5. (a) Explain the advantages of active filter. Explain different configurations of active filter. Discuss their merits and demerits.
(b) List out the applications of VCO 566. [10+6]
6. (a) Explain the significance of each of comparators and operation of 555 timer.
(b) Explain the application of 555 timer as linear ramp generator. [10+6]
7. (a) Explain the operation of a Successive Approximation type analog to digital converter.
(b) Calculate the no. of bits required to represent a full scale voltage of 10V with a resolution of 5mV approximately. [10+6]
8. (a) What is Gyration circuit? Explain its operation with a neat circuit diagram.
(b) What is a sample and hold circuit? Why is it needed? With neat circuit diagram, describe the operation of an op - amp based sample and hold circuit. [8+8]

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1. (a) Derive the output voltage of an op - amp based differential amplifier.
(b) List out electrical characteristics of an op - amp. [10+6]
2. (a) What is an op-amp? Why it is called so?
(b) Explain the parameters that should be considered for ac and dc applications of an op-amp.
(c) Draw and explain the three open loop op - amp configurations with neat circuit diagram. [4+7+5]
3. (a) Draw the circuit diagram of a two input non-inverting type summing amplifier and derive the expression for the output voltage.
(b) Briefly explain why negative feedback is desirable in amplifier applications.
(c) How does negative feedback affect the performance of an inverting amplifier? [7+5+4]
4. (a) Design a logarithmic amplifier for positive input voltages in the range 5mV to 50V.
(b) With suitable circuit diagram explain the operation of a triangular wave generator using a comparator and a integrator. [8+8]
5. (a) Draw a band - pass filter circuit with its frequency response curve. Explain its working.
(b) Design a first order wide band reject filter with a higher cutoff frequency of 100Hz and a lower cutoff frequency of 1kHz. Calculate the Q of the filter. [8+8]
6. (a) Explain the operation of a zero crossing detector.
(b) Briefly mention the disadvantages of using zero crossing detector and how it is overcome in Schmitt trigger. [8+8]
7. (a) Draw a schematic diagram of a D/A converter. Use resistance values whose ratios are multiples of 2. Explain the operation of the converter.
(b) Draw the block diagram of a converting 4-bit A/D converter and explain its operation. Sketch the output waveform. [8+8]
8. (a) Explain the use of IC 1496 as AM modulator

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Set No. 2

- (b) What is a sample and hold circuit? Draw the circuit diagram and explain its action. [8+8]

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1. For the cascaded differential amplifier shown in figure 1

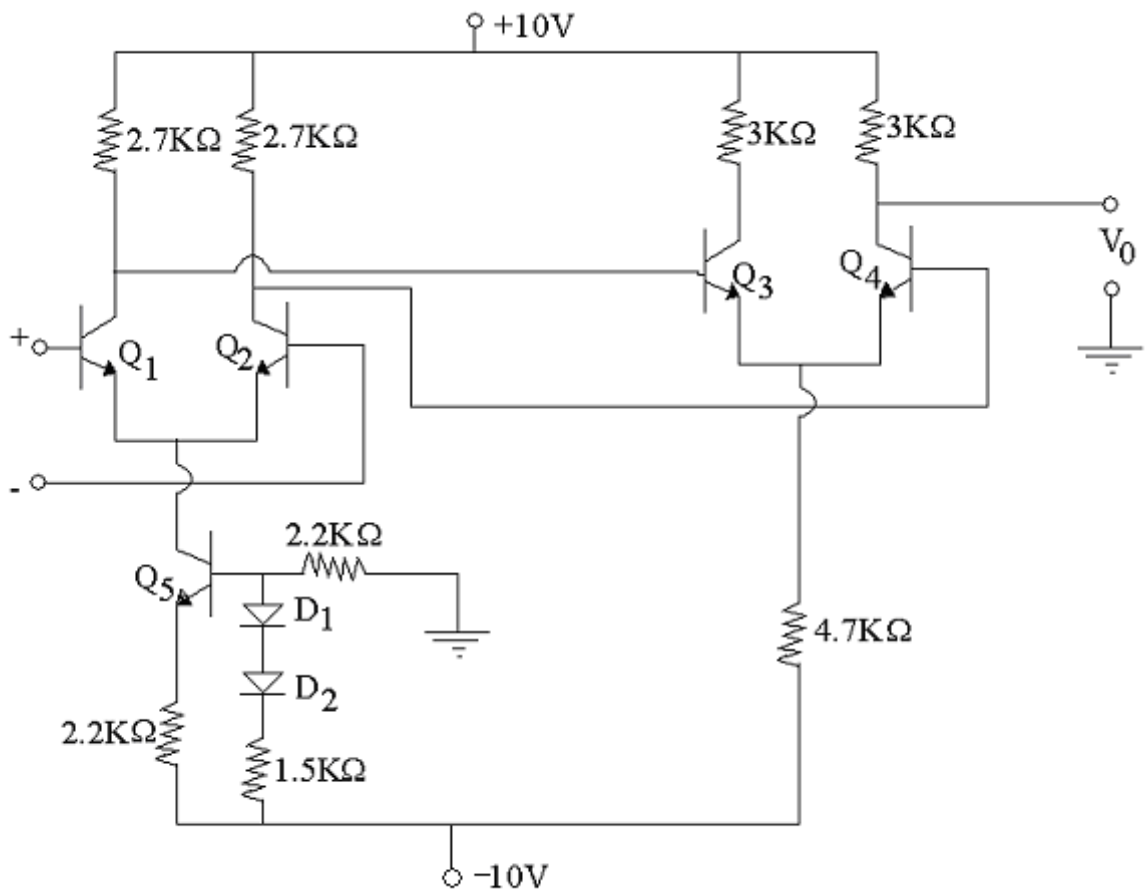


Figure 1

- (a) Perform the dc analysis and
 (b) Calculate the overall voltage gain. Assume $h_{fe} = 100$, $V_{BE} = V_D = 0.7V$. [16]
2. (a) For the 741 IC op - amp, the supply voltage rejection ratio (SVRR) is $150\mu V/V$. Calculate the change in this op - amp's input offset voltage V_{io} if the supply voltages are varied from $\pm 10V$ to $\pm 12V$.
 (b) List and explain the characteristics of an ideal op - amp.
 (c) Draw the pin diagram of $\mu A741$ op - amp. [4+8+4]

3. (a) Design a current to voltage converter using OP-AMP and explain how it can be used to measure the output of photocell.
(b) Discuss the differences between differential amplifiers used in the first two stages of OP- AMP. [8+8]
4. (a) Design an RC phase shift oscillator for a frequency of 500Hz.
(b) Explain the operation of an op - amp based monostable multivibrator.[6+10]
5. (a) Explain the term “Frequency Scaling” with a suitable example.
(b) Design a wide band-pass filter with $f_H=200\text{Hz}$, $f_L=1\text{KHz}$ and a pass-band gain=4. Draw the frequency response and calculate Q factor for the filter. [6+10]
6. (a) Explain the operation of Monostable multivibrator using 555 timer. Derive the expression of time delay of a Monostable multivibrator using 555 timer.
(b) Design monostable multivibrator using 555 timer to produce a pulse width of 100 m sec. [10+6]
7. Write shorts on:
 - (a) Tracking type analog to digital converters.
 - (b) Comparison of conversion times and hardware complexities of various analog to digital converters. [8+8]
8. (a) What do you mean by sampling? Explain the basic circuit for sample and hold circuit.
(b) Explain the operation of balanced modulator with neat sketch. [8+8]

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- Define CMRR? Explain how this can be improved for differential amplifier with suitable diagram.
 - What is the voltage at point A and B for the circuit shown in figure 1 if $v_1=5v$ and $v_2=5.1v$. [8+8]

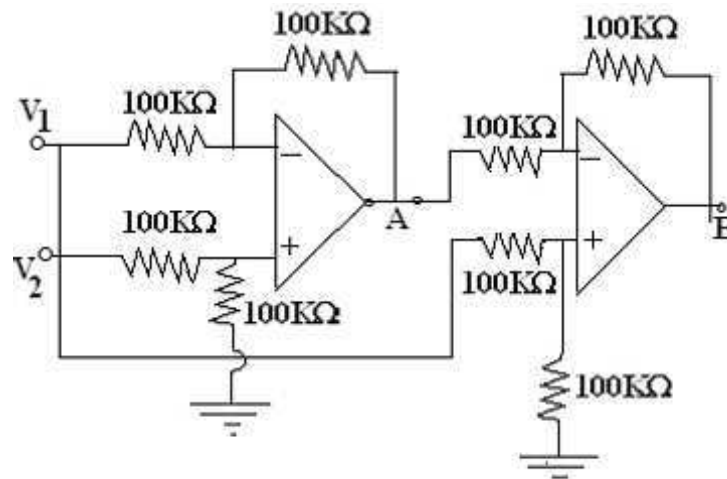


Figure 1

- What are the three operating temperature ranges of the IC?
 - List out the AC characteristics of an op - amp and discuss about them.
 - Draw an equivalent circuit of op - amp. [4+8+4]
- In an integrator circuit, $R_i = 10Kohms$, $C_F = 1$ second, and the input is a step input $V_{in} = 2V$ for $0 \leq t \leq 4$. Determine the output voltage and sketch it.
 - Draw the frequency response curve of a differentiator. How is it modified when a small resistor is connected in series with the capacitor? [8+8]
- Design a monostable multivibrator with trigger pulse shape which will drive an LED, 'ON' for 0.5 seconds each time it is pulsed.
 - Derive the frequency of oscillation of a RC phase shift oscillator and explain the operation of the circuit. [6+10]
- List the conditions for oscillation in all the three types of oscillators, namely, RC phase shift, Wien - bridge and quadrature oscillators.

- (b) Design an op - amp based relaxation oscillator and derive the frequency of oscillation. [8+8]
6. (a) Explain how phase locked loop is used as a frequency translator and AM demodulator.
- (b) Explain linear ramp generation using 555 timer. [8+8]
7. (a) Define important performance specifications of Digital to Analog converters listing their typical values.
- (b) Describe the operation of an R - 2R ladder type DAC. [8+8]
8. (a) What is balanced modulator and explain with neat diagram.
- (b) Explain the logic diagram and functional table of 4 to 1 line multiplexer. [8+8]
